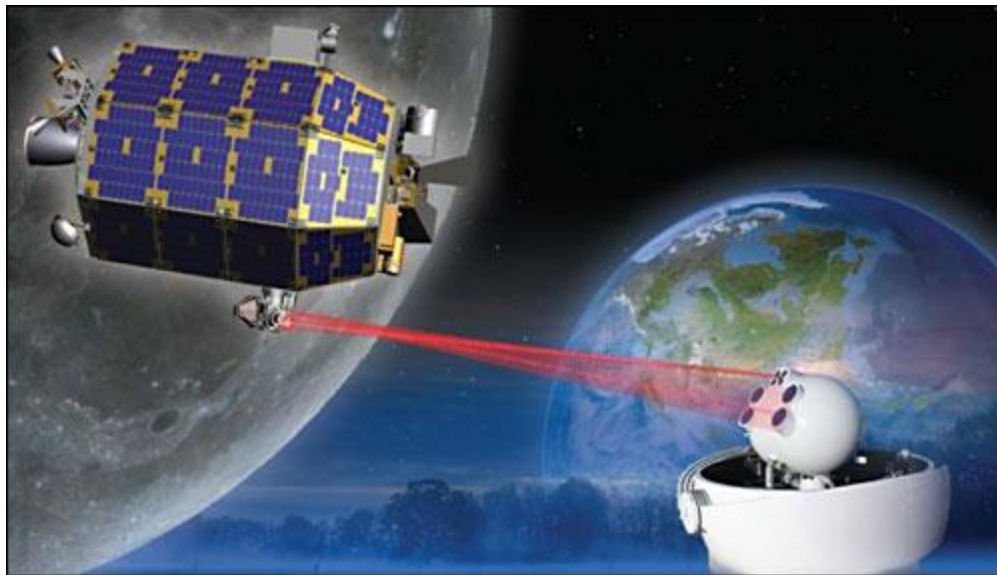


# . Space Lasers Have ‘Bright Future’ in Communications

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[Dec 2013](#) GREENBELT, Md., Dec. 30, 2013 — Neither wind, nor clouds, nor even atmospheric turbulence kept NASA’s Lunar Laser Communication Demonstration (LLCD) from its mission of providing error-free communications to ground stations from lunar orbit, NASA said recently in releasing results of the 30-day experiment.

“Throughout our testing we did not see anything that would prevent the operational use of this technology in the immediate future,” said Don Cornwell, LLCD mission manager at NASA’s Goddard Space Flight Center in Greenbelt.



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NASA scientists and engineers seeking faster connectivity with their data-gathering spacecraft are moving away from radio frequency-based communication and turning to [laser communications](#). Courtesy of NASA.

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LLCD hitched a ride to lunar orbit aboard the Lunar Atmosphere and Dust Environment Explorer, known as LADEE, and was designed to confirm laser communication capabilities from a distance of almost a quarter-of-a-million miles. In addition to demonstrating record-breaking data download and upload speeds to the moon at 622 and 20 Mb/s, respectively, LLCD also showed that it could operate as well as any NASA radio system. The sending and receiving of high-definition video was proven with a message from NASA administrator Charlie Bolden, completing the trip to the moon and back with only a few seconds of delay.

LLCD demonstrated error-free communications during broad daylight, including operating when

the moon was to within 3° of the sun as seen from Earth, NASA officials said. LLCD also demonstrated error-free communications when the moon was low on the horizon, less than 4°, as seen from the ground station, which also demonstrated that wind and atmospheric turbulence did not significantly impact the system. LLCD was even able to communicate through thin clouds, an unexpected bonus, officials said.

LLCD also demonstrated the ability to download data from the LADEE spacecraft itself. “We were able to download LADEE’s entire stored science and spacecraft data [1 GB] in less than five minutes, which was only limited to our 40-Mb/s connection to that data within LADEE,” Cornwell said. That feat would have taken several days to complete using LADEE’s onboard radio system.

LLCD proved the integrity of laser technology to send not only error-free data, but also uncorrupted commands and telemetry or monitoring messages to and from the spacecraft over the laser link, NASA said.

The system also demonstrated the ability to “hand off” the laser connection from one ground station to another, just as a cellphone does a hand-off from one cell tower to another. An additional achievement was the ability to operate LLCD without using LADEE’s radio at all.

“We were able to program LADEE to awaken the LLCD space terminal and have it automatically point and communicate to the ground station at a specific time without radio commands,” Cornwell said. “This demonstrates that this technology could serve as the primary communications system for future NASA missions.”

NASA’s follow-on mission for laser communications will be the Laser Communications Relay Demonstration (LCRD). Also managed at Goddard, LCRD will demonstrate continuous laser relay communication capabilities at more than 1 billion bits per second between two Earth stations using a satellite in geosynchronous orbit. The system also will support communications with Earth-orbiting satellites. More importantly, LCRD will demonstrate this operational capability for as long as five years.

“We are very encouraged by the results of LLCD,” **said Badri Younes, NASA’s deputy associate administrator for Space Communications and Navigation (SCaN)** in Washington, which sponsored the mission. “From where I sit, the future looks very bright for laser communications.”

For more information, visit: <http://llcd.gsfc.nasa.gov>, [www.nasa.gov/ladee](http://www.nasa.gov/ladee) or <http://esc.gsfc.nasa.gov/267/LCRD.html>